

Respiratory Protection



What is in an Atmosphere?

O E T

OXYGE
N

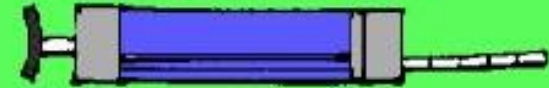


EXPLOSIV
ES

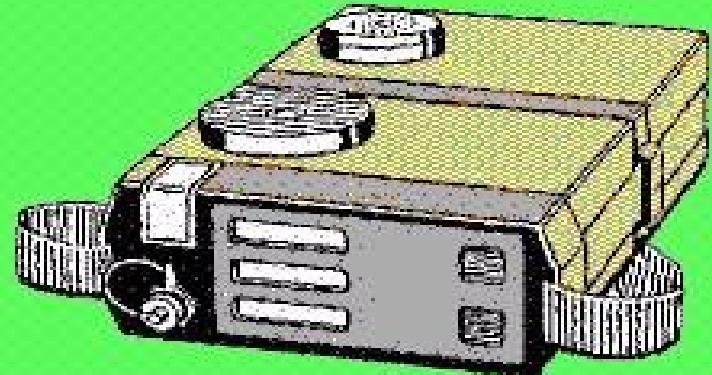
Explosive Meters



Tube type detectors



TOXICANT
S



OXYGEN



22
%

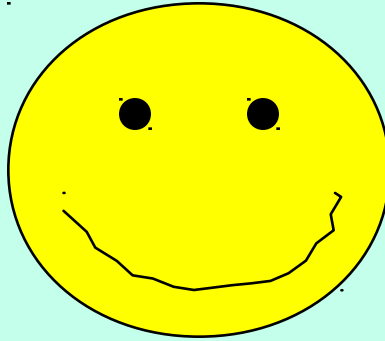
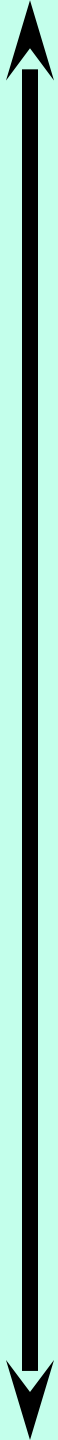
20.7
%

19.5
%

12
%

10
%

0



Normal at Sea
Level

OXYGEN



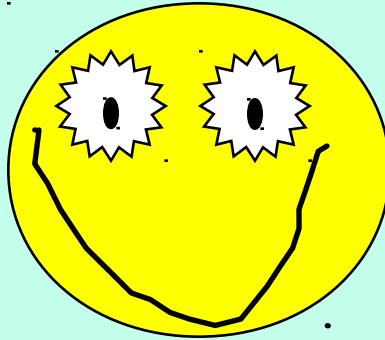
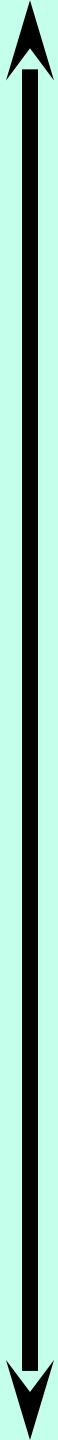
**22
%**

**20.7
%**

**19.5
%**

**12
%**

**10
%**



Wide Awake,
Hyper
Vigilant

OXYGEN



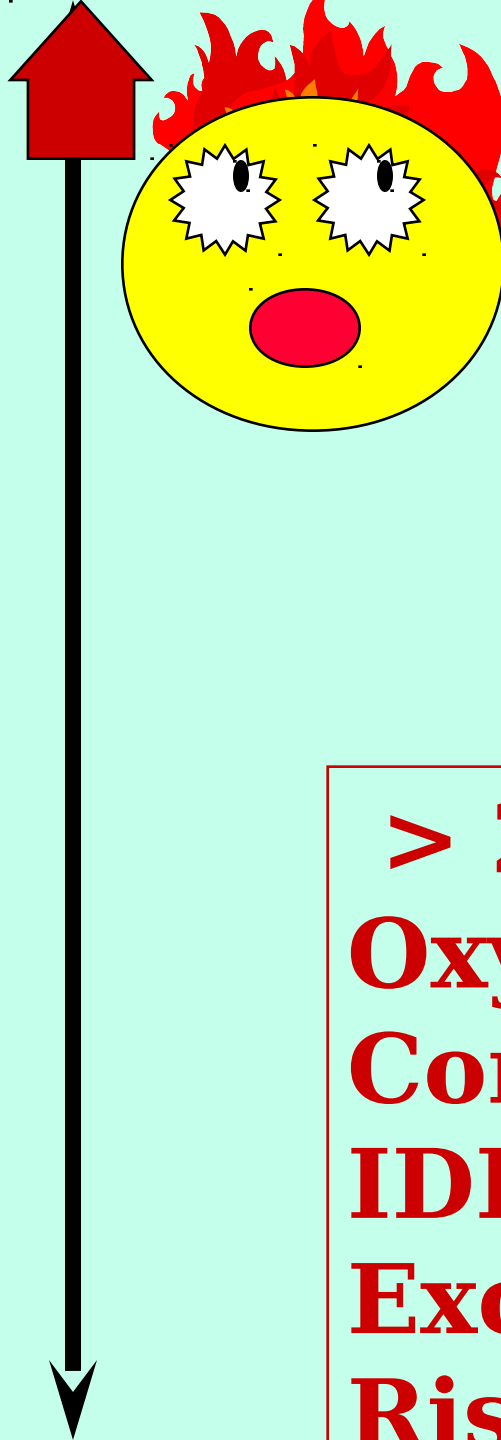
**22
%**

**20.7
%**

**19.5
%**

**12
%**

**10
%**



> 26 % O₂,
Spontaneous
Combustion Can
Occur

**> 22 %
Oxygen is
Considered
IDLH Due to
Exceptional
Risk of Fire**

OXYGEN



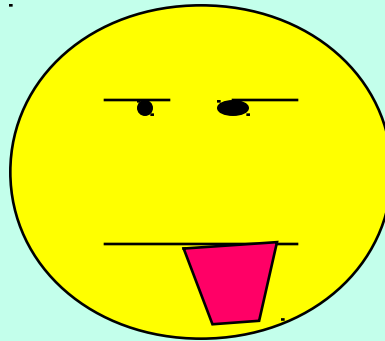
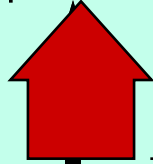
22
%

20.7
%

19.5
%

12
%

10
%



Loss of
Coordination, Loss
of Perception,
Lack of Judgment

**< 19.5 % Oxygen
Considered
IDLH by OSHA --
Entry Requires
CO's Permission**

OXYGE



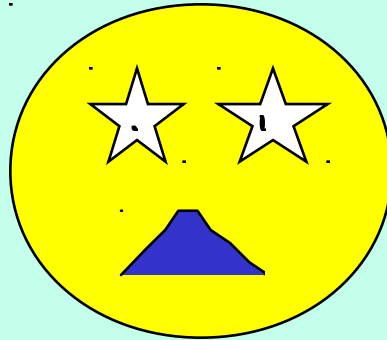
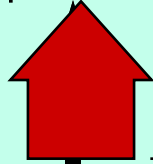
22
%

20.7
%

19.5
%

12
%

10
%



Blue Lips,
Disorientation



OXYGE



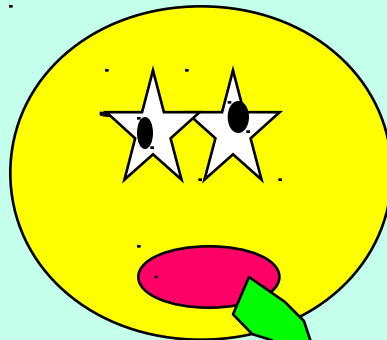
22
%

20.7
%

19.5
%

12
%

10
%



Vomit

OXYGEN



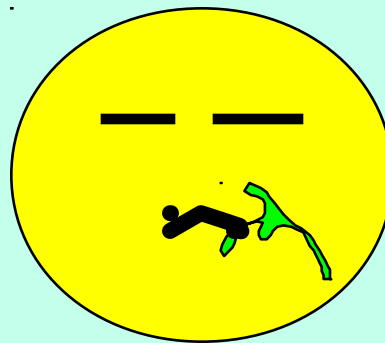
22
%

20.7
%

19.5
%

12
%

10
%



Unconscious

5 min : Could
recover 6 min:
50% Fatal 8
min: 100% Fatal

OXYGE



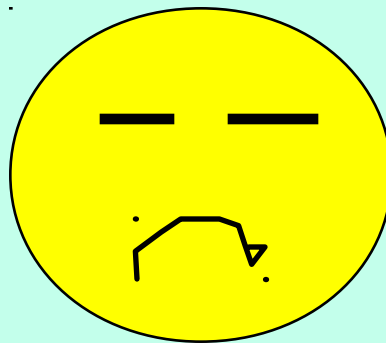
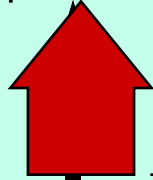
22
%

20.7
%

19.5
%

12
%

10
%



Coma in
40
Seconds

OXYGE



**22
%**

**20.7
%**

**19.5
%**

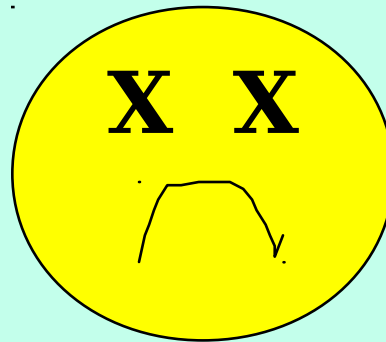
**12
%**

**10
%**



**Just
Remember . . .**

**Oxygen Levels
Greater than
22% or Less
than 19.5% are
IDLH !**



Death

Reasons for Oxygen deficiency:

Factors

- **Fires**
- **Rusting (Oxidation)**
- **Inerting**
- **Decomposing Organic Matter**
 - **Sewage**
 - **Fermentation of grains, sugars, etc.**

EXPLOSIVE



**Greater Than 10% LEL is
Considered IDLH -- and
Requires CO's Permission
for Entry**

Explosivit

UEL

100

Rich

LEL

10

%

Explosive
Range

Too

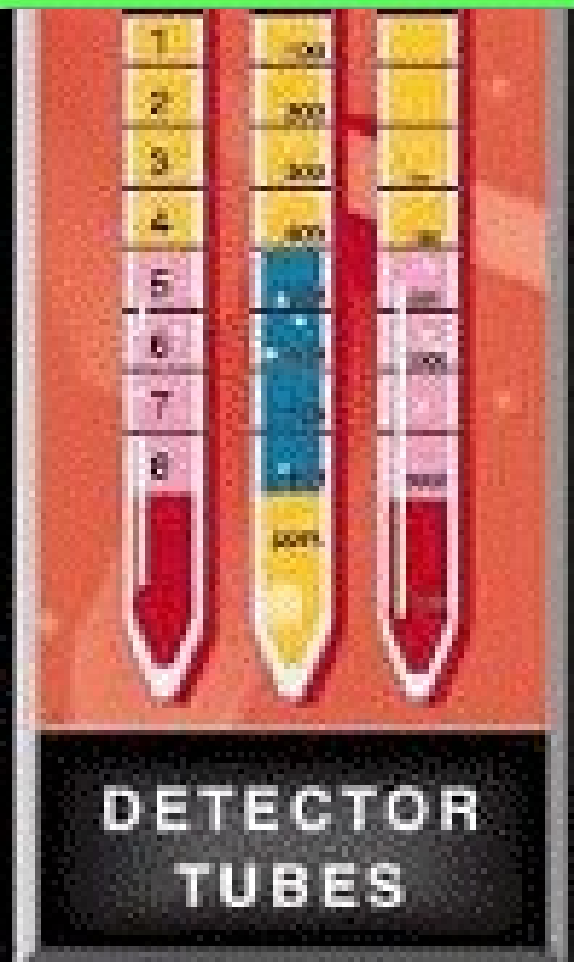
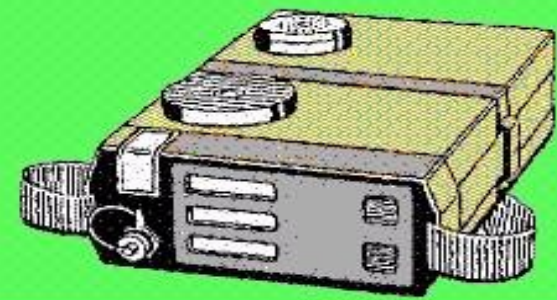
Lean

% Vapor

Toxic

Common Shipboard Hazards

Carbon Monoxide
Hydrogen Sulfide
Halon & Freon
Carbon Dioxide
Nitrogen Dioxide
Methane
Hydrogen
Ammonia



Man Killed By Own Gas

Bloomberg News Service, 25 March

A terrible diet and a room with no ventilation are being blamed for the death of a man who was killed by his own gas. An autopsy revealed large amounts of methane gas in his system.

His diet consisted primarily of beans and cabbage. It was just the right combination of foods.

It appears that the man died in his sleep from breathing the poisonous cloud that was hanging over his bed. Had his windows been open, it wouldn't have been fatal. But the man was shut up in his near airtight bedroom.

He was a big man with a huge capacity for creating this deadly gas. Three of the rescuers got sick and one was hospitalized.

IDLH

PEL

15

**Supplied Air Respirator w/
minute backup Air Requirement**

Respiratory Protection Mandate
**(Filter Type Respirator
or Supplied Air Respirator
as Appropriate)**

Respiratory Protection Option

REPAIR AND MAINTENANCE ACTIVITIES

- Generate air contaminants
- Ventilation most effective method of protection
- When not practical, respirators necessary

6 Elements of a Respiratory Protection Program

ADMINISTRATION

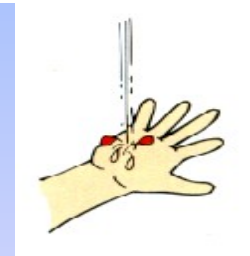
- Respiratory Protection Officer
 - Assigned by the CO
 - Administers program
 - Ensures there is a written SOP
 - Maintains roster of personnel in program
 - Ensures users are:
 - Fit Tested
 - Medically Qualified (done by DOC)
 - Trained in the wearing, usage, and storage
 - ANNUALLY

KNOWLEDGE OF HAZARDS Toxic Materials Enter Body 3 Ways

☀ Ingestion (eating, drinking)



② Absorption (touching)



③ Inhalation (breathing)



CONTROL OF RESPIRATORY HAZARDS

But first, we have to know
what the Respiratory Hazards
are...

RESPIRATORY HAZARDS

- ***OXYGEN DEFICIENCY*** -
- Occurs in Confined Spaces when oxygen is displaced or consumed (**less than 19.5%**)
- Chemical Reaction (rust)
fire, welding



RESPIRATORY HAZARDS

- ***CONTAMINANT LADEN***
- Particulate Matter (dust, fumes, mist)
- Gases or Vapors
- Combination of gaseous and particulate

CONTROLLING HAZARDS

✓ HAZARD ASSESSMENT

- Gas free tests for:
 - Oxygen
 - Explosives
 - Toxics

✓ HAZARD CONTROL

- Nature of work:
 - Spray Painting
 - Solvent Cleaning
 - Power Sanding
 - Welding
 - Sandblasting

SELECTION OF EQUIPMENT

✓ ***ONLY NIOSH/MSHA APPROVED***

- IDLH Conditions
- Concentration
- Oxygen deficiency possible
- Degree of protection



CLASSES OF RESPIRATORY PROTECTION EQUIPMENT

- Air Purifying
- Supplied Air

AIR PURIFYING

- Remove contaminants from atmosphere
- Do not generate oxygen (must be used in 19.5 - 22% O₂ atmosphere)

AIR PURIFYING

- ① Mechanical - protection from particles (dust, fumes, fog)
- ② Chemical - vapors and gases in low concentrations



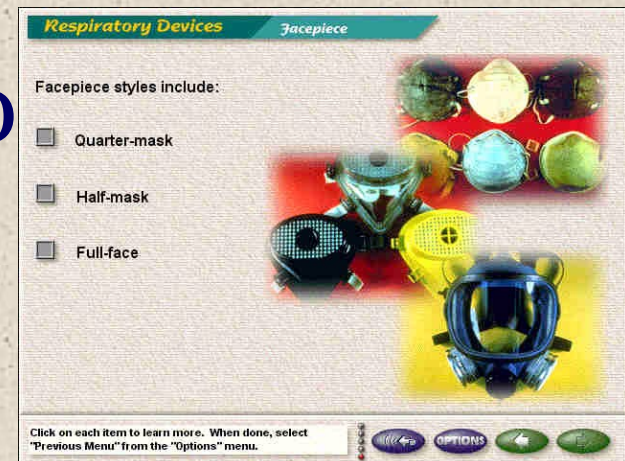
CARTRIDGE SELECTION

- Color coded for intended use

➡ LISTING OF COLOR CODE:
MANUFACTURER'S
CHART NAVOSH

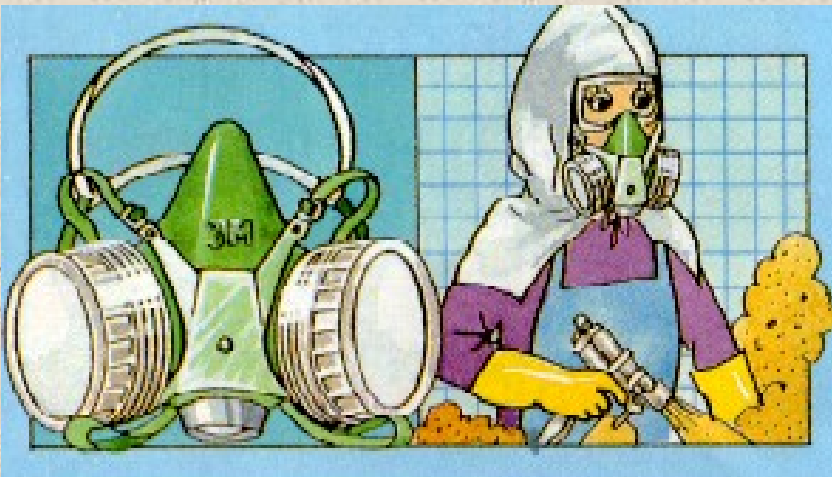
MANUAL B-6

- Filters labeled
- Cartridge combination



REUSABLE HALF MASK

- Replaceable cartridges to capture gases and vapors
- Prefilter to trap particles



SUPPLIED AIR RESPIRATORS

- Air-line
- Self-Contained Breathing Apparatus (SCBA)

DEMAND MODE

- Supplies air upon user inhalation
- Creates negative pressure within facepiece
- Some leakage may occur

PRESSURE DEMAND MODE

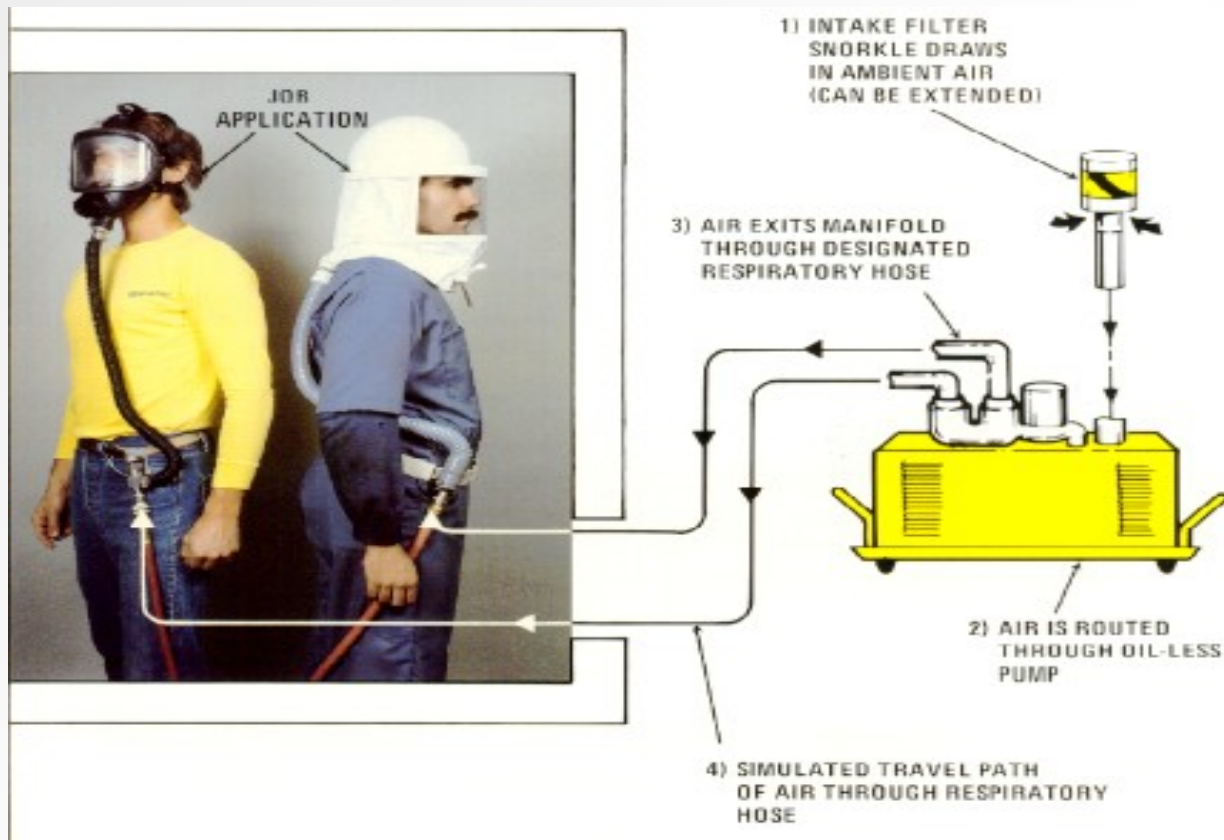
- Continuous **positive** pressure within facepiece
- Prevents leakage into facepiece
- SCBA (Scott Air Pack)
- SAR with SCBA

CONTINUOUS FLOW

- Continuous ***positive pressure and flow*** of air to facepiece
- Rhine Air Pump

RHINE AIR PUMP

- LP air driven
- Ambient air
- 50 Ft collapsible hose
- 2 Person capacity
- Snorkle
- ***No back-up air!***



RHINE AIR PUMP

IDLH RESPIRATORY REQUIREMENTS

- “Full facepiece, SCBA in pressure demand mode”
or
- “Full facepiece air-line respirator in pressure demand mode with 15 minute auxiliary air supply”

NSTM 074 vol 3

SUPPLIED AIR RESPIRATOR WITH SCBA (SAR WITH SCBA)

- Fulfills requirements of
NSTM 074 Vol 3

USE LATEST AND GREATEST IN
RESPIRATORY PROTECTION

PASP

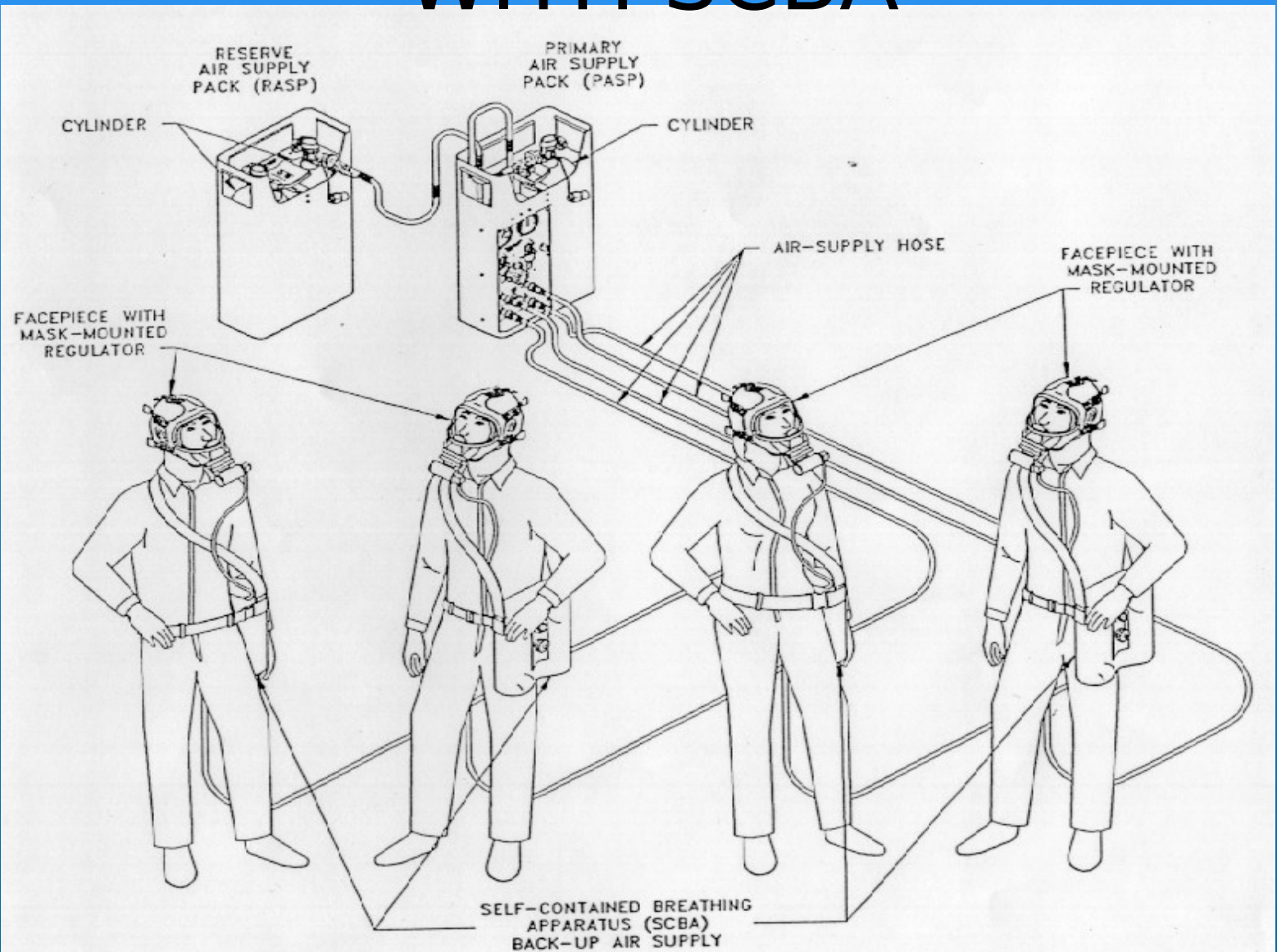
RASP

SCBA



SUPPLIED AIR RESPIRATOR WITH
SCBA
(SAR WITH SCBA)

SUPPLIED AIR RESPIRATOR WITH SCBA





Questions?